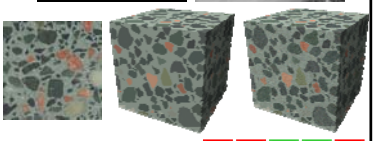
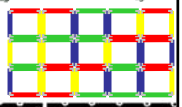
Non-Photorealistic Rendering (NPR)

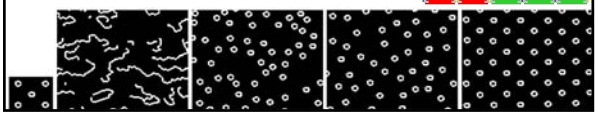
Last Time?


- Texture Synthesis
- Markov Model
- Image Completion
- Wang Tiles
- Volumetric Texture Synthesis



"I spent an interesting evening recently with a grain of salt."





Final Presentation Schedule

Tues. April 22
- *course evaluations*

1. Ted & Sreekanth
2. Chris Y. & Igor
3. Scott & Chris W.
4. Joseph

Fri. April 25
1. Steve W., Chris S. & JP
2. Jhon & Danny C.
3. John S. & Zachary
4. Jixu

Tues. Apr 29
1. Jon B., Justin, & Stephen
2. Dan B.
3. Brett & Dan N.
4. Ed & Stephen

Including setup & questions:
15 min (individual), 25 min (team of 2), 35 min (team of 3)

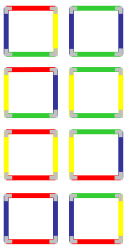
Final Presentation

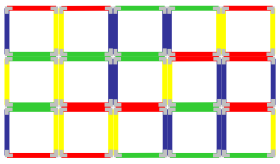
- Summarize prior work as necessary
  - You don't need to discuss papers we covered in class
- Be technical:
  - What were the challenges?
  - How did you solve them?
- Live demo if possible (depends on project)
  - Use examples (both of success & failure)
- Teams of 2 or 3:
  - All should present & make it clear who did what
- Practice! & time yourself!

From Last Time:

- Wang Tiles for Texture Synthesis
- Volumetric Texture Synthesis

Wang Tiles



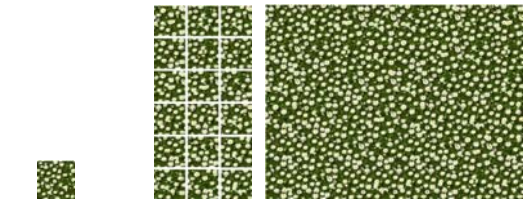


Align tiles to match edge color to create non-periodic tilings

"Wang Tiles for Image and Texture Generation", *Cohen, Shade, Hiller, Deussen*, SIGGRAPH 2003

Wang Tile Texture Synthesis

- As a precomputation, fill the tiles with texture
- Then create infinite amounts of non-periodic texture!



Input texture sample | Automatically generated set of Wang tiles | Synthesized textures using Wang tiling

"Wang Tiles for Image and Texture Generation", *Cohen, Shade, Hiller, Deussen,* SIGGRAPH 2003

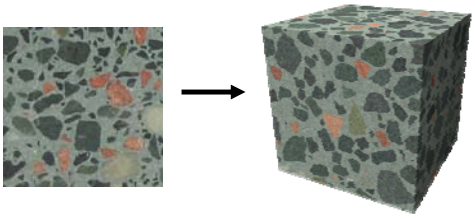
From Last Time:

- Wang Tiles for Texture Synthesis
- Volumetric Texture Synthesis

Objective

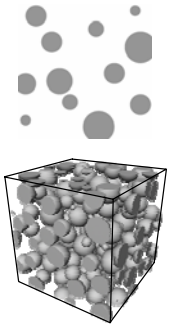
"Stereological Techniques for Solid Textures" Jagnow, Dorsey, & Rushmeier, SIGGRAPH 2004

Given a 2D slice through an aggregate material, create a 3D volume with a comparable appearance.



Slide from Rob Jagnow

Recovering Sphere Distributions



N_A = Profile density (number of circles per unit area)

N_V = Particle density (number of spheres per unit volume)

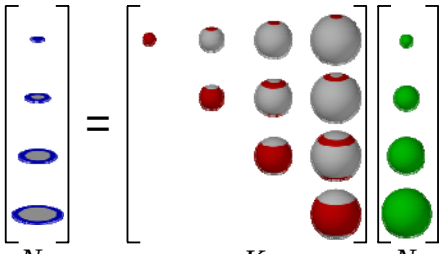
$\overline{H}$ = Mean caliper particle diameter

The fundamental relationship of stereology:

$$N_A = \overline{H} N_V$$

Slide from Rob Jagnow

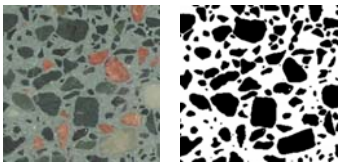
Recovering Sphere Distributions



Slide from Rob Jagnow

Profile Statistics

Segment input image to obtain profile densities N_A.



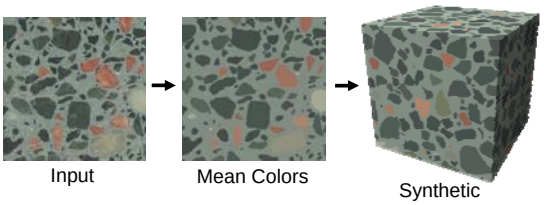
Input | Segmentation

Bin profiles according to their area, $\sqrt{A / A_{\max}}$

Slide from Rob Jagnow

Recovering Color

Select mean particle colors from segmented regions in the input image



Input Mean Colors Synthetic Volume

Slide from Rob Jagnow

Recovering Noise

How can we replicate the noisy appearance of the input?

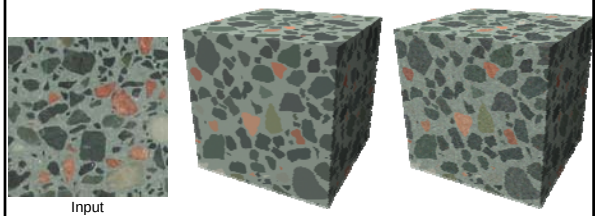
Input - Mean Colors = Residual

The noise residual is less structured and responds well to Heeger & Bergen's method

Synthesized Residual

Slide from Rob Jagnow

Putting It All Together

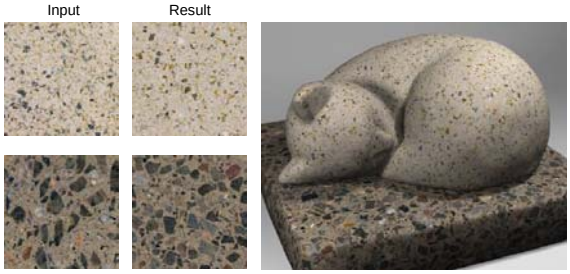


Input Synthetic volume without noise Synthetic volume with noise

Slide from Rob Jagnow

Results

Input Result



Slide from Rob Jagnow

Readings for Today:

Choose one:

- "Isophote Distance: A Shading Approach to Artistic Stroke Thickness", Goodwin, Vollick, & Hertzmann, NPAR 2007
- "Soft Shadow Volumes for Ray Tracing", Laine, Aila, Assarsson, Lehtinen, & Akenine-Moller, SIGGRAPH 2005